

WHAT IS CLAIMED IS:

1. A process for making polymer-dye particles comprising, in order:

I) forming a colorant mixture comprising a water insoluble dye and an organic medium containing at least one ethylenically-unsaturated monomer;

II) combining the colorant mixture with an aqueous mixture comprising a surfactant and a co-stabilizer to form a colorant mixture/aqueous mixture;

III) causing the colorant mixture/aqueous mixture to form a stable aqueous droplet mixture via strong agitation; and

IV) initiating polymerization to form composite polymer-dye particles comprising a colorant phase and a polymer phase;

wherein an addition polymerization initiator is added prior to initiating polymerization.

2. The process of Claim 1 wherein the co-stabilizer is clay, silica, or an inorganic metal salt, hydroxide or oxide; a starch, a sulfonated cross-linked organic homopolymer, a resinous polymer or copolymer, hexadecane, cetyl alcohol, or any steric hydrophobic stabilizer.

3. The process of Claim 1 wherein the co-stabilizer is hexadecane, cetyl alcohol, or a steric hydrophobic stabilizer.

4. The process of Claim 1 wherein the polymer formed is a homopolymer.

5. The process of Claim 1 wherein the polymer formed is a cross-linked polymer and the organic medium contains a mixture of ethylenically-unsaturated monomers comprising:

- a) at least one ethylenically-unsaturated monomer being free of ionic charge groups and being capable of addition polymerization to form a substantially water-insoluble homopolymer; and
- b) at least one ethylenically-unsaturated monomer capable of being a cross-linker.

6. The process of Claim 1 wherein the polymer formed is a copolymer containing at least one ethylenically-unsaturated monomer being free of ionic charge groups and being capable of addition polymerization to form a substantially water-insoluble homopolymer.

7. The process of Claim 1 wherein the strong agitation is sonification, homogenization, or microfluidization.

8. The process of Claim 1 wherein the water insoluble dye has a solubility of less than 1 g/L in aqueous media.

9. The process of Claim 1 wherein the water insoluble dye is a xanthene dye, anthroquinone dye, methine or polymethine dye, merocyanine dye, azamethine dye, azine dye, quinophthalone dye, thiazine dye, oxazine dye, phthalocyanine dye, mono or poly azo dye, or metal complex dye.

10. The process of Claim 1 wherein the water insoluble dye is an azo dye or a metal complex dye.

11. The process of Claim 10 wherein the azo dye is an arylazoisothiazole dye.

12. The process of Claim 10 wherein the metal complex dye is a transition metal complex of an 8-heterocyclazo-5-hydroxyquinoline.

13. The process of Claim 1 wherein the addition polymerization initiator is an azo initiator, a peroxide initiator, a persulfate initiator, or a redox initiator.

14. The process of Claim 5 wherein the ethylenically-unsaturated monomer free of ionic charge groups is methyl methacrylate, ethyl methacrylate, butyl methacrylate, ethyl acrylate, butyl acrylate, hexyl acrylate, n-octyl acrylate, lauryl methacrylate, 2-ethylhexyl methacrylate, nonyl acrylate, benzyl methacrylate, 2-hydroxypropyl methacrylate, acrylonitrile, methacrylonitrile, vinyl acetate, vinyl propionate, vinylidene chloride, vinyl chloride, styrene, t-butyl styrene, vinyl toluene, butadiene, or isoprene.

15. The process of Claim 5 wherein the ethylenically-unsaturated monomer capable of being a cross-linker is vinyl acrylate, vinyl methacrylate; a diene; an ester of saturated glycols or diols with unsaturated monocarboxylic acids, or a polyfunctional aromatic compound.

16. The process of Claim 1 wherein the composite polymer-dye particles have a particle size of less than 1 μm .

17. The process of Claim 1 wherein the composite polymer-dye particles have a particle size of less than 200 nm.

18. The process of Claim 1 wherein the composite polymer-dye particles have a mean size of less than about 200 nm and the polymer phase has a molecular weight of greater than about 5000.

19. The process of Claim 1 wherein the polymer phase has a molecular weight of greater than about 10,000.
20. The process of Claim 1 wherein the ratio of the colorant phase to the polymer is phase is from about 10:90 to about 90:10.
21. Composite polymer dye particles prepared by the process of Claim 1.
22. Composite polymer dye particles comprising a colorant phase containing a water insoluble dye and a polymer phase, said particles being associated with a co-stabilizer.
23. The composite polymer dye particles of Claim 22 wherein the co-stabilizer is clay, silica, or an inorganic metal salt, hydroxide or oxide; a starch, a sulfonated cross-linked organic homopolymer, a resinous polymer or copolymer, hexadecane, cetyl alcohol, or any steric hydrophobic stabilizers.
24. The composite polymer dye particles of Claim 22 wherein the co-stabilizer is hexadecane, cetyl alcohol, or a steric hydrophobic stabilizer.
25. The composite polymer dye particles of Claim 22 wherein the water insoluble dye has a solubility of less than 1 g/L in aqueous media.
26. The composite polymer dye particles of Claim 22 wherein the water insoluble dye is a xanthene dye, anthroquinone dye, methine or polymethine dye, merocyanine dye, azamethine dye, azine dye, quinophthalone dye, thiazine dye, oxazine dye, phthalocyanine dye, mono or poly azo dye, or metal complex dye.

27. The composite polymer dye particles of Claim 22 wherein the water insoluble dye is an azo dye or a metal complex dye.

28. The composite polymer dye particles of Claim 27 wherein the azo dye is an arylazoisothiazole dye.

29. The composite polymer dye particles of Claim 27 wherein the metal complex dye is a transition metal complex of an 8-heterocyclazo-5-hydroxyquinoline.

30. The composite polymer dye particles of Claim 22 wherein the composite polymer-dye particles have a particle size of less than 1 μm .

31. The composite polymer dye particles of Claim 22 wherein the composite polymer-dye particles have a particle size of less than 200 nm.

32. The composite polymer dye particles of Claim 22 wherein the composite polymer-dye particles have a mean size of less than about 200 nm and the polymer phase has a molecular weight of greater than about 5000.

33. The composite polymer dye particles of Claim 22 wherein said polymer phase has a molecular weight of greater than about 10,000.

34. The composite polymer dye particles of Claim 24 wherein the ratio of the colorant phase to the polymer phase is from about 10:90 to about 90:10.